

**FRENCHTOWN CHARTER TOWNSHIP
WATERMAIN CONSTRUCTION SPECIFICATIONS ORDINANCE
Ord. No. 209; Date of Adoption: February 26, 2008**

An Ordinance to establish certain watermain construction specifications and requirements as to all watermain construction work on watermains, lines and appurtenances within the Township and to establish penalties for violation of the Ordinance.

THE CHARTER TOWNSHIP OF FRENCHTOWN HEREBY ORDAINS:

Section 1. GENERAL.

These specifications along with the Drawings titled "Standard Watermain Details and Notes" for Frenchtown Charter Township which consist of drawing plan sheets W-1, W-2 and W-3 ("Drawings"), shall govern all watermain construction in Frenchtown Charter Township. Said Drawings are incorporated herein and made a part of this Ordinance. The specifications and requirements of this Ordinance and the Drawings as defined above shall be a necessary part of any contract for watermain construction within the Township. The term watermain construction includes all work on mainlines including appurtenant items and related construction.

1.1 Reference Standards: Where noted in these specifications, all referenced standards refer to the latest revisions to the following specifications.

1.1.1 AWWA means the American Waterworks Association.

1.1.2 ASTM means the American Society for Testing and Materials.

1.1.3 ANSI means the American National Standards Institute.

1.1.4 MDOT means the Michigan Department of Transportation Standards Specifications for Construction.

1.1.5 PPI means Plastic Pipe Institute, Inc.

1.1.6 UNI - BELL means the Uni-Bell PVC Pipe Association.

1.1.7 Recommended Standards for Water Works (Ten States Standard)
Great Lakes - Upper Mississippi River Board of State and
Provincial Public Health and Environmental Managers.

1.1.8 AASHTO means American Association of State Highway and
Transportation Officials.

1.2 Point of Manufacture

All materials must be certified to have been manufactured in the United States of America or Canada.

1.3 Permits and Approvals

1.3.1 Prior to installation of any water main in Frenchtown Charter Township, construction plans shall be prepared in accordance with these Water Main Specifications and the Township Engineering Standards. The construction plans must be submitted to and approved in writing by the following agencies of jurisdiction, where applicable:

- Frenchtown Charter Township Engineer
- Frenchtown Charter Township Water Department
- Frenchtown Charter Township Fire Department
- Monroe County Road Commission
- Monroe County Drain Commission
- Michigan Department of Environmental Quality (Act 399 Permit)
- Projects may be subject to other agency approvals and it shall be the responsibility of the owner, developer and or designer to investigate and secure all required approvals for the project.

1.3.2 Any and all permits as required and issued by the agencies listed in the preceding section, shall be issued and on file with the Township Engineer prior to commencing any water main construction activities.

Section 2. WATERMAIN MATERIALS.

2.1 Pipe Materials: Prior to installation of any waterline, the material manufacturer shall submit a sworn statement that the material has been inspected and tested and complies with all specification requirements, including location of production.

2.1.1 Cast Iron Pipe: Cast iron pipe shall not be permitted for water main installation.

2.1.2 Polyvinyl Chloride (PVC) and Molecularly Oriented Polyvinyl Chloride (PVCO) Pressure Pipe: PVC pressure pipe shall meet the requirements of AWWA C900. PVCO pressure pipe shall meet the requirements of AWWA C909. Both PVC and PVCO pressure pipe are permitted in pipe sizes 8" through 12" diameter. PVC and PVCO pressure pipe shall be made from Class 12454-A or Class 12454-B virgin compounds as defined in ASTM D1784. PVC pressure pipe shall provide a hydrostatic design basis (HDB) rating of 4,000 psi @ 73.4° F per the requirements of PPI TR-3.

PVCO pressure pipe shall have a starting stock HDB rating of 4,000 psi @ 73.4° F per the requirements of PPI TR-3. Finished PVCO pressure pipe shall have an HDB rating of 7,100 psi per ASTM D1598 and D2837. The outside diameter (OD) of PVC and PVCO pressure pipe shall conform with the OD dimensions of ductile iron pipe. PVC pressure pipe shall have a dimension ratio of 18 and a minimum pressure class of 150 psi. PVCO pressure pipe shall have a minimum pressure class of 150 psi. All pipe shall have an integral wall-thickened bell end designed for joint assembly using a factory installed elastomeric gasket conforming to ASTM F477 to affect the pressure seal. All pipes shall be designed for direct connection into ductile iron pipe and fittings.

2.1.2.1 Polyvinyl Chloride (PVC) Pressure Pipe 14” through 48” diameter:

PVC pressure pipe shall meet the requirements of AWWA C905. PVC pressure pipe will be permitted in pipe sizes 14" through 48" diameter. PVC pressure pipe shall be made from Class 12454-A or Class 12454-B virgin compounds as defined in ASTM D1784, providing a hydrostatic design basis rating of 4,000 psi @ 73.4° F per the requirements of PPI TR-3. The outside diameter (OD) of PVC pressure pipe shall conform to the OD dimensions of ductile iron pipe. The PVC pressure pipe shall have a dimension ratio of 18 and a pressure class of a minimum 235 psi. Pipe shall have an integral wall-thickened bell end designed for joint assembly using a factory installed elastomeric gasket conforming to ASTM F477 to affect the pressure seal. Pipe shall be designed for direct connection into ductile iron pipe and fittings.

2.1.2.2 Fusible Polyvinyl Chloride (PVC) Pressure Pipe 8” through 48” diameter:

Fusible Polyvinyl Chloride plastic material for pipe shall conform to AWWA C900 or C905, ASTM D1784 and cell classification 12454. Pipe shall be in accordance with ASTM D2241 for IPS standard dimensions as indicated in these specifications. Compound formulation shall be in accordance with PPI TR-2/2006. The pipe shall be manufactured with 100% virgin resin with 0% recycled plastic content. Fusible Polyvinyl chloride pipe shall be extruded with plain ends (no bell) with the ends square to the pipe with no bevel or chamfer. The pipe shall be blue in color and shall be furnished in 20’, 30’ or 40’ nominal lengths. The minimum dimension ratio shall be 14 unless approved otherwise by the Engineer. The minimum pressure rating for the pipe shall be 200 PSI for C900 and 300 PSI for C905 pipe. The Township Engineer must approve the use of Fusible Polyvinyl Chloride pipe in any water main project within the township.

2.1.3 Ductile Iron Pipe: Ductile iron pipe shall meet the requirements of AWWA C151 (ANSI A21.51). The minimum pipe thickness shall be Class 52 as per AWWA C150 (ANSI A21.50). Pipe joints shall be bolted mechanical or push-on rubber gasketed meeting the requirements of AWWA C111 (ANSI A21.11). All pipe shall be inside coated with a cement-mortar lining in accordance with AWWA C104 (ANSI A21.4). Pipe shall be outside coated with a bituminous coating approximately 1 mil in

thickness and wrapped with a polyethylene encasement. The polyethylene film shall be a minimum 8 mil thickness and installed as per AWWA C105. All nuts, bolts, and washers used on mechanical joint pipe fittings shall be COR-BLUE and the fasteners shall be field coated with pipe joint mastic or an approved corrosion protective spray paint (bituminous base non-toxic undercoat spray paint) when installed. Use of #316 stainless steel nuts, bolts and washers for field installed mechanical joints may be permitted only upon written approval of the Water Department.

2.1.4 Prestressed Concrete Pressure Pipe: Prestressed concrete pressure pipe shall meet the requirements of AWWA C301. The pipe shall be designed for a sustained internal pressure of 150 psi.

2.1.5 High Density Polyethylene Pipe: High density polyethylene pipe conforming to ASTM D1598 and D3350, AWWA C906 and ANSI/NSF-14 and 61, material shall be comprised of PE 3408 Resin with a cell classification of PE334434C. Pipe shall have a wall thickness of DR-11 and a working pressure rating of 160 psi. Pipe shall be furnished in Ductile Iron pipe sizes. Pipe shall be handled and installed in accordance with manufacturer's recommendations. Pipe shall be furnished with continuous, permanent print line identifying pipe size, pressure rating, trade name, material classification, ASTM and NSF standards, pipe test category, plant location and shift, date of manufacture, operator and extruder numbers, and supplier of raw materials. Exterior wall print line must bear NSF – PW identification. No installations shall exceed ten feet (10') of cover unless approved by the Engineer or as directed by the plans and specifications. The Township Engineer must approve the use of HDPE pipe in any water main project within the township.

2.1.6 Detectable Tracer Tape: Detectable Tracer Tape shall be installed on all Township water main installations. This tape shall be installed for positive pipe locations by pipe/cable locators and a visible warning to excavators. The detection tape shall be not less than 2-inches wide; shall be inert, bonded layer plastic with a metallized foil core. The tape shall be colored blue per the APWA Uniform Color Code with minimum 1-1/4" high lettering warning of buried water line repeated at least every 24-inches. The tape shall be installed in the trench backfill at a depth of twelve inches (12") above the pipe. When horizontal directional drilling is used to install the water main, two 12 gauge solid copper wire wrapped around the pipe and secured to the top of the pipe at 25' intervals shall be required by the Township Engineer for positive pipe location purposes unless otherwise approved by the Township.

2.1.7 Water Main Pipe Installed Under Road Pavement: At all locations where a water main will be installed under a primary road or main local road, the water main pipe material shall be ductile iron pipe as previously specified. At locations within residential subdivisions, site condominiums and or minor non-industrial roads, the water main pipe material may be PVC pipe as previously specified. Water mains installed within industrial subdivisions, industrial developments and under

any paved surface within commercial developments shall be ductile iron pipe as previously specified.

2.1.8 Water Main Pipe Installed in Steel Casing Pipe: Water main pipe installed inside steel casing pipe shall be Ductile Iron pipe as previously specified or PVC pipe as previously specified. All pipe installed in the steel casing shall be provided mechanical joint restraints. The Ductile Iron pipe shall be wrapped with polyethylene encasement having a minimum 8 mil thickness.

2.2 FITTINGS

2.2.1 Fittings (3" through 24"): All fitting sizes 3" through 24" shall meet the requirements of AWWA C153 (ANSI A21.53) Pressure Class 350 or AWWA C110 (ANSI A21.10) Pressure Class 350. All fittings shall be provided with a bolted mechanical or push-on rubber gasketed joint meeting the requirements of AWWA C111 (ANSI A21.11). All fittings shall be constructed of ductile iron. Fittings shall be inside coated with a cement-mortar lining in accordance with AWWA C104 (ANSI A21.4). Also fittings shall be outside coated with a bituminous coating approximately 1 mil in thickness and wrapped with a polyethylene encasement. The polyethylene film encasement shall be a minimum 8-mil thickness and installed as per AWWA C105. All nuts, bolts, and washers used on mechanical joint pipe fittings shall be COR-BLUE and the fasteners shall be field coated with pipe joint mastic or an approved corrosion protective spray paint (bituminous base non-toxic undercoat spray paint) when installed. Use of #316 stainless steel nuts, bolts and washers for field installed mechanical joints may be permitted only upon written approval of the Water Department.

2.2.2 Fittings (30" through 64"): All fitting sizes 30" through 64" shall meet the requirements of AWWA C110 (ANSI A21.10) Pressure Class 250. All fittings shall be provided with a bolted mechanical or push-on rubber gasketed joint meeting the requirements of AWWA C111 (ANSI A21.11). All fittings shall be constructed of ductile iron. Fittings may be constructed of gray iron when ductile iron is not available. Fittings shall be inside coated with a cement-mortar lining in accordance with AWWA C104 (ANSI A21.4) and wrapped with a polyethylene encasement. The polyethylene film shall have a minimum 8-mil thickness and installed as per AWWA C105. All nuts, bolts, and washers used on mechanical joint pipe fittings shall be COR-BLUE and the fasteners shall be field coated with pipe joint mastic or an approved corrosion protective spray paint (bituminous base non-toxic undercoat spray paint) when installed. Use of #316 stainless steel nuts, bolts and washers for field installed mechanical joints may be permitted only upon written approval of the Water Department.

2.2.3 Fittings and Couplings for HDPE Pipe: All fittings shall be pressure rated to match the system to which they are joined. The manufacturer of the pipe shall be the same as the manufacturer of the fittings and other fabrications.

2.3 **HYDRANTS**

2.3.1 Dry-Barrel Fire Hydrants: Dry-barrel fire hydrants shall be Waterous Pacer 5 1/4" traffic model WB67; East Jordan Midwest 5BR or Mueller 5-1/4" Super Centurion 250 having the following features: a 5-1/4" valve opening 6" mechanical joint inlet as per ANSI A21.11, two (2) each 2-1/2" hose nozzles, one (1) 4-1/2" pumper nozzle, 1-1/2" pentagon shaped operating nut for installation in a 5' 6" trench, open left, breakable flange and bolts, and factory painted yellow above grade and black below. All hose and pumper nozzles shall be national standard threaded. All hydrants shall be furnished with the drainage hole factory plugged. Dry-barrel fire hydrants shall meet the requirements of AWWA C502. All Fire Hydrants shall be furnished from the manufacturer assembled with #316 stainless steel bolts, nuts and washers. All nuts, bolts, and washers used on mechanical joint connections shall be COR-BLUE and the fasteners shall be field coated with pipe joint mastic or an approved corrosion protective spray paint (bituminous base non-toxic undercoat spray paint) when installed. Use of #316 stainless steel nuts, bolts and washers for field installed mechanical joints may be permitted only upon written approval of the Water Department.

2.4 **VALVES** All valves are to be supplied with epoxy coating or two coats of asphalt tar varnish.

2.4.1 Resilient Seated Gate Valves: Resilient seated gate valves shall be as manufactured by Mueller, East Jordan and have the following features: ductile iron body, bronze mounted, non-rising stem, rubber-covered gate, open left, design operating pressure 200 psi, 2" operating nut, and mechanical joint ends as per AWWA C111 (ANSI 21.11). Resilient seated gate valves shall not be used in 16" diameter or larger water main pipe. All resilient seated gate valves shall meet the requirements of AWWA C509. All valves shall be furnished from the manufacturer assembled with #316 stainless steel bolts, nuts and washers. All nuts, bolts, and washers used on mechanical joint connections shall be COR-BLUE and the fasteners shall be field coated with pipe joint mastic or an approved corrosion protective spray paint (bituminous base non-toxic undercoat spray paint) when installed. Use of #316 stainless steel nuts, bolts and washers for field installed mechanical joints may be permitted only upon written approval of the Water Department.

2.4.2 Rubber-Seated Butterfly Valves: Butterfly valves shall be Kennedy Valve Manufacturing Company Model "ADAP-TORQ" or Pratt Model "Ground Hog" having the following features: ductile-iron body, rubber-seated, open left, mechanical joint ends as per AWWA C111 (ANSI A21.11) and 2" square operating nut. All butterfly valves shall meet the requirements of AWWA C504, Class 150B. All valves used in 16" or larger diameter pipe shall be butterfly valves. Equivalent butterfly valves may be accepted upon written approval of the Township Engineer. All valves shall be furnished from the manufacturer assembled with #316 stainless steel bolts, nuts and

washers. All nuts, bolts, and washers used on mechanical joint connections shall be COR-BLUE and the fasteners shall be field coated with pipe joint mastic or an approved corrosion protective spray paint (bituminous base non-toxic undercoat spray paint) when installed. Use of #316 stainless steel nuts, bolts and washers for field installed mechanical joints may be permitted only upon written approval of the Water Department.

2.4.3 Hydrant Valves: Hydrant valves shall be of the same specifications as resilient seated gate valves (2.4.1). All hydrant valves shall be 6" in size.

2.5 VALVE BOXES

2.5.1 Gate Valve Boxes: Valve boxes shall be Tyler Pipe Series 6860 Item D having the following features: constructed of cast iron, three (3) pieced, 5-1/4" shaft, screw type adjustment, adjustable 45" to 66" extension range, and complete with a lid marked "WATER" in raised letters. Valve boxes shall be furnished with a #6 round base for 12" and smaller valves and a #8 round base for 12", 14" or 16" valves. Valve box bases for valves larger than 16" shall be as approved by the Engineer.

2.6 TAPPING SLEEVES

2.6.1 Watermain Tapping Sleeves: Watermain tapping sleeves shall be #316 stainless steel including the flange. The shell, lift bar, bolts, nuts, washers, and flange shall be stainless steel. The flange gasket shall be factory installed virgin SBR compound or equal for water mains. The tapping sleeve shall be provided with a stainless steel 3/4" NPT test plug for pressure testing the sleeve prior to tapping the main. The tapping sleeve and valve shall be installed and pressure tested at 90 lbs. for 5 minutes with no loss to be approved to proceed with tapping the main. Tapping sleeves shall be Romac Industries, Inc., "SST", Power Seal Pipeline Products Corp. Model 3490, or approved equal. Special tapping sleeves for tapping concrete cylinder pipe shall be Romac Industries, Inc., "FTS 435" steel fabricated tapping sleeve or approved equal. Approved equal tapping sleeves shall be subject to submittal of manufacturer specifications and approval of the Township Engineer. All nuts, bolts, and washers used on mechanical joint connections shall be COR-BLUE and the fasteners shall be field coated with pipe joint mastic or an approved corrosion protective spray paint (bituminous base non-toxic undercoat spray paint) when installed. Use of #316 stainless steel nuts, bolts and washers for field installed mechanical joints may be permitted only upon written approval of the Water Department.

2.7 BOLTS, NUTS AND WASHERS

2.7.1 All bolts, nuts and washers used by the manufacturer to fabricate and assemble hydrants, tapping sleeves, resilient seated gate valves and butterfly valves shall be #316

stainless steel. All portions of these fasteners exposed after installation must be field coated with rust preservative spray paint (bituminous base non-toxic undercoat spray paint), which is approved by the Township.

2.7.2 All bolts, nuts and washers used for the installation of sleeves, couplings, and mechanical joint fittings shall be COR-BLUE approved equal. Use of #316 stainless steel nuts, bolts and washers for field installed mechanical joints may be permitted only upon written approval of the Water Department.

2.8 **JOINT RESTRAINTS:** Mechanical joint restraints may be required in lieu of or in conjunction with thrust blocking if conditions require. Mechanical restrained joints shall be provided at all valves, reducer fittings and as noted on the Standard Water Main Details and Notes sheets. Three sets of shop drawings must be submitted for review and approval. Restrainers must accommodate the full working pressure ratings and associated safety factor of the specified class of pipe and must be UL or FM approved. Mechanical joint restraints shall meet and or exceed the specification requirements of the pipe material specifications as previously stated. The joint restraints shall be Megalug Series 1100 for Ductile Iron Pipe or Series 2000PV Megalug Mechanical Joint Restraints for C900, C905 or IPS OD PVC pipe as manufactured by EBAA Iron, Inc. or approved equal. In addition to certification, a copy of manufacturer's recommendations for installation must be supplied to the Township Engineer. Restrained mechanical joints shall be provided at all main line valves, all hydrant branch pipe joints and / or as called out in the construction plans.

2.9 **BACKFLOW PREVENTERS:** Backflow preventer shall be furnished as a complete single unit of the size required to accommodate the full working volume required for the installation. Backflow preventers must be of the type, model and manufacturer acceptable to the Frenchtown Water Department. Backflow preventers shall be required on all 1½" and larger commercial and industrial meter installations. RPZ and double check valves must be purchased from the Frenchtown Charter Township Water Department.

2.10 **WATER SERVICE CONNECTIONS:** Water service lines shall be constructed from the main to one foot beyond the right-of-way or as otherwise indicated on the plans or these specifications. Any field changes to the water services as noted on the approved construction plans must be reviewed and approved by the Water Department prior to making the changes in the field.

2.10.1 **Water Service Lines:** Water service lines shall be constructed of minimum 1 inch Type K soft copper tubing AWWA C-800 with no splices on lengths of 100' or less. Wherever splices are required for service lines greater than 100', the splice shall not be located under any pavement and shall use the method and materials as required by the Township Water Department. Service line splices, where required, shall be made using a Ford or Mueller compression fitting (Pack Joint) with locking nut.

Polyethylene water service tubing meeting the requirements of AWWA C-901 pressure class 200, NSF approved for contact with potable water may be used upon approval of the Water Department.

Services 2" to 3" shall be type "K" soft copper AWWA C-800 specification, PVC (Polyvinyl Chloride) plastic pressure pipe stamped NSF approved for contact with potable water as defined by ASTM D-1785.

Services 4" and over shall be ductile iron pipe or PVC pressure pipe as previously specified. No other type of pipe material such as iron, steel or galvanized iron shall be used from the curb stop to and including the meter setting.

Detectable tracer tape as previously specified shall be installed on all plastic and or polyethylene water service lines.

2.10.2 Corporation Stops: Corporation Stops shall have taper thread inlet and pack joint compression coupling (Ball Type Corporation Valves) as manufactured by Ford or Mueller.

2.10.3 Curb Stops: Curb stops shall be ball valves with pack joints both sides with Minneapolis pattern valve as manufactured by Ford or Mueller and as approved by the Frenchtown Charter Township Water Department. Curb stops shall be located at the road right-of-way line at the lot frontage for water mains located on the opposite side of the road from the lot to be serviced. The curb stop shall be located at the road right-of-way line or water main easement line where the water main is located on the same side of the road as the lot to be serviced. Curb stop locations shall be shown on the construction plans and the stop box location approved on the plans shall not be changed or revised unless approved by the Water Department.

2.10.4 Curb Boxes: Curb boxes shall be furnished complete Minneapolis Pattern 1¼" upper, 5 point nut on top, with Brass Pentagon Head Plug as manufactured by Mueller, M and E Manufacturing, or as approved by the Frenchtown Charter Township Water Department.

2.10.5 Meters: Water meters must be purchased from the Frenchtown Charter Township Water Department.

2.10.6 Service Saddles: All service taps shall be made using a double strap brass saddle as manufactured by Ford or Mueller.

2.11 MANHOLES

2.11.1 Materials: Manholes shall be constructed of precast concrete or block laid radially with each seventh course as stretchers with one quarter inch mortar joints.

Materials shall conform to Section 17, STRUCTURES and Section 18, VALVE MANHOLES and plan sheets titled "Watermain Detail and Notes".

2.12 MANHOLE STEPS

2.12.1 Aluminum Manhole Steps: Aluminum manhole steps shall be fabricated of aluminum alloy conforming to Federal Specification QQ-A-200/8 having a minimum tensile strength of 38,000 psi and minimum yield strength of 35,000 psi. Elongation shall not be less than 10% in 2 inches and each step shall be capable of carrying a load in the center of the cross bar of 1,500 lbs. when projected 4 inches from the wall without permanent deformation. Steps shall have a tread 10 inches in width and a minimum 2-inch vertical hook on the ends embedded in concrete.

2.12.2 Reinforced Polypropylene Plastic Manhole Steps: Plastic coated steel steps shall be fabricated of co-polymer polypropylene with 2 inch minimum deformed reinforcing rod continuous throughout the entire length of legs and tread. The polypropylene plastic shall meet the requirements of ASTM D2146, Type II Grade 16906. The manufacturer shall furnish certified test data for the polypropylene plastic used in each lot of steps. The steel material shall be Grade 60 and conform to the requirements of ASTM A616.

2.13 MANHOLE CASTINGS

2.13.1 Materials: Manhole castings shall be manufactured of gray iron conforming to the requirements AASHTO M105/ASTM A48 Class 35B or ASTM A48 Class 30 or ductile iron conforming to ASTM A536. Castings shall be coated with water base, bituminous asphalt coating by the manufacturer. All castings shall be clearly marked with the manufacturer's name and company logo. Castings shall be No. 2020 as manufactured by East Jordan Iron Works, R-1771 as manufactured by Neenah Foundry or approved equal.

2.13.2 Specifications: All castings shall have machined bearing surfaces and be rated heavy-duty. All castings shall have an inside clear opening of 24 inches.

2.13.3 Covers: Manhole covers shall be solid and manufactured with the word "WATER" in raised letters.

2.14 STRUCTURAL STEEL

2.14.1 Structural Steel: Structural Steel shall meet the specifications of AISC and shall be fabricated as specified in the plans.

Section 3. RESPONSIBILITY FOR MATERIALS.

- 3.1 **MATERIALS:** The Contractor is responsible for all materials furnished. Any material defective in manufacture or damaged to due handling after delivery shall be immediately removed from the project area.
- 3.2 **STORAGE:** The Contractor is responsible for the safe storage of materials for the project until these are incorporated into the work.
- 3.3 **CERTIFICATION:** Prior to the installation of any watermain material, the contractor shall submit all required shop drawings, the material manufacturer information/cut sheets, sworn statement that the material has been inspected, tested, and complies with all specification requirements, and has been manufactured in the United States or Canada. The Contractor shall deliver this certification to the Township Engineer for approval prior to any installation.

Section 4. HANDLING OF PIPE, APPURTENANCES AND ACCESSORIES.

- 4.1 **DELIVERY:** All pipe, fitting, valves, hydrants, valve boxes, and related accessories shall be unloaded at the point of delivery and distributed along the project area by the Contractor, unless otherwise directed. Materials shall not be placed on private property. Materials shall at all times be handled with care to avoid damage. In loading and unloading, they shall be lifted by hoists or skid, or rolled on skidways in such manner as to avoid shock. Under no circumstances shall they be dropped. Pipe handled on skidways must not be skidded or rolled against pipe already on the ground.
- 4.2 **DISTRIBUTION:** In distributing the material at the site of the work, each piece shall be unloaded opposite or near the place where it is to be laid in the trench.
- 4.3 **PROTECTION AND STORAGE**
 - 4.3.1 **Care of Pipe Coating:** Pipe shall be handled in such manner that a minimum amount of damage to the coating will result. Damaged coating shall be repaired in a manner satisfactory to the Engineer.
 - 4.3.2 **Interior Surfaces:** The interior of all pipe, fittings, and other accessories shall be kept free from dirt and foreign matter at all times. The Contractor shall clean and/or flush the interiors and working parts of any waterline materials that have not been property stored prior to installation.
 - 4.3.3 **Frost Protection:** Valves and hydrants before installations shall be drained and stored in a manner that will protect them from damage by freezing.

Section 5. ALIGNMENT AND GRADE.

- 5.1 **GENERAL:** All pipe shall be laid and maintained to the required lines and grades with

fittings, valves and hydrants at the required locations, joints must be centered and spigots home. All valve and hydrant stems must be plumb.

5.1.1 Protecting Underground and Surface Structures: Temporary support required by adequate protection and maintenance of all underground and surface utility structures, drains, sewers and other obstructions encountered in the progress of work shall be furnished and maintained by the Contractor under the direction of the Engineer at no additional cost to the Owner.

5.1.2 Deviations Occasioned by Other Utility Structures: Wherever existing utility structures or branch connections leading to main sewers or to main drains, or other conduits, ducts, pipes or structures present obstructions to the grade and alignment of the pipe, they shall be permanently supported, removed, relocated, or reconstructed by the Contractor through cooperation with the owner of the utility, structure or obstruction involved. In those instances where their relocation or reconstruction is impracticable, a deviation from line and grade will be ordered and the change shall be made in the manner directed. Minor changes will be paid at the unit price bid amounts. Major changes or revisions utilizing components or items of work not anticipated in the original scope of work shall be paid for with Additional Compensation in accordance with Contract Documents and Contract Unit Prices.

5.1.3 Deviation with Engineer's Consent: No deviation shall be made from the required line or grade except with the written approval of the Township Engineer.

5.2 SUBSURFACE EXPLORATION: Underground structures which may be encountered or which may affect the progress of the work have been determined from careful field survey and are shown on the plans in as much detail and with such accuracy as is practicable. The Township does not guarantee the location shown to be absolutely correct. Any inconsistencies or inaccuracies in the location of structures revealed during the progress of construction does not relieve the Contractor from responsibility for damage to same nor in any way entitle the Contractor extra compensation under the terms of this Contract. House connections to sewers, water and gas services may not be shown, but shall be anticipated in construction and the Contractor shall use due and proper precautions to protect same from injury.

5.3 DEPTH OF PIPE COVER: All water main pipe shall be laid to have a minimum depth of cover of five (5) feet when in earth excavation and four and one-half (4-1/2) feet of cover when rock is encountered, measured from the established street grade or the surface of the permanent improvement to the top of the barrels of the pipe or depths of cover otherwise indicated on the approved construction drawings or as required in Supplementary Specifications. The depth of cover provided at stream crossings shall be in accordance with the detail provided on the Frenchtown Charter Township Standard Water Main Details and Notes Drawing Sheets.

5.3.1 DEPTH OF COVER OVER WATER SERVICE LINES: All water service lines shall be laid to have a minimum cover of four (4) feet measured from the proposed finish grade to the top of the service line piping.

Section 6. PROTECTION OF EXISTING UTILITIES AND STRUCTURES.

6.1 REQUIREMENTS: Prior to commencing excavation, the Contractor shall be required to adhere to the provisions of Act 53 of Public Acts of 1974 as amended. The contractor shall call Miss Dig at 1-800-482-7171 a minimum of 72 hours, three working days in advance of commencing any excavation activities.

6.2 EXISTING SEWERS, DRAINS UTILITIES: Unless otherwise directed, the Contractor shall protect and not damage any existing utility. If damage is done, the Contractor shall repair such damage and leave such utility in as good condition as when first encountered. Water mains, sewers and drains, before backfilling, shall be provided with structural steel or other Engineer approved supports across the trench, and this expense shall be incidental to the item of "Excavation".

Whenever existing water, gas or other utility services, pipe or structures are encountered in the construction, they shall be protected by the Contractor. Any damage to them by the Contractor shall be reimbursed to the Utility involved. If not paid before Contract completion, the Township shall deduct such expenses from the final Contract payment.

Services, pipes or structures needing supports across or in the trench shall be properly supported with structural steel or other suitable material by the Contractor in coordination with the owner of the utilities before any backfilling is attempted. Provision for the cutting of any utility services, which crosses the trench, shall be made by the Contractor with the utilities, and such expense of cutting and reconnecting shall be borne by the Contractor. Any expense incurred by the Contractor because of interference of utility services, pipe or structures with the excavation shall be regarded as incidental to the cost of waterline construction.

6.3 CROSSING UNDER EXISTING RAILROAD TRACKS: In laying the water main under railroad tracks or within railroad rights-of-way, special care must be taken to properly shore up and protect the tracks and maintain traffic over them. This work shall be done in such a manner as will meet with the approval of the railroad companies involved; and the Contractor shall save the Township harmless from any damage or injury resulting to such companies or individuals by reason of this work.

The Contractor shall encase the main that is laid under railroad tracks or in railroad rights-of-way with concrete or install watermain inside steel casing pipe which has been

installed across the railroad property by the jack and bore method, as indicated on plans or as required by permit from the railroad company.

The expense involved for the protection of tracks by the use of track supports or any other expenses involved in such crossing shall be borne by the Contractor.

The expense involved for securing permits, insurance and inspection required by railroads for work with their right-of-way shall be borne by the Contractor unless otherwise noted.

Section 7. EXCAVATION AND PREPARATION OF TRENCH.

7.1 DESCRIPTION: The trench shall be dug to the alignment and depth required and only so far in advance of pipe laying as the Engineer shall permit. The trench shall be so braced and drained in accordance with the requirements as established by MIOSHA. It is essential that the discharge from pumps be led to natural drainage channels, to drains, or to storm sewers.

7.1.1 Width: The trench width may vary with and depend upon, the depth of trench and the nature of the excavated material encountered; but in any case, shall be of ample width to permit the pipe to be laid and jointed properly and the backfill to be placed and compacted properly. The width of trench from a point two feet above the top of the pipe to the bottom of the trench shall be 12" wider than the outside diameter of the pipe being installed.

7.2 PIPE FOUNDATION: The trench shall have a flat bottom conforming to the grade to which the pipe is to be laid. The pipe shall be laid upon a 3" to 6" stone cradle carried up to a point 6" to 12" above the pipe bell (in accordance with Section 9.3.1 - Pipe Bedding). The barrel of the pipe shall have an even bearing for its full length.

7.2.1 Correcting Faulty Grade: Any part of the trench excavated below grade shall be corrected with the approved bedding material, thoroughly compacted.

7.2.2 Pipe Foundation in Poor Soil: When the bottom uncovered at subgrade is soft and, in the opinion of the Engineer, cannot support the pipe, a further depth and/or width shall be excavated and refilled to pipe foundation grade as required, or other approved means shall be adopted to assure a firm foundation for the pipe.

7.3 PIPE CLEARANCE IN ROCK: Ledge rock, boulders, and large stones shall be removed to provide a clearance of at least 6" below all parts of the pipe, valves, or fittings, and to a clear width of 6" on each side of all pipe and appurtenances for pipes 16" or less in diameter; for pipes larger than 16", a clearance of 9" below and a clear width of 9" on each side of pipe shall be provided. Adequate clearance for properly jointing pipe laid in rock trenches shall be provided at bell holes.

7.3.1 Subgrade in Rock Trench: Excavations below subgrade in rock or in boulders shall be refilled to subgrade with approved material and thoroughly compacted.

7.3.2 Rock Excavation Defined: Rock shall be boulders over one-third (1/3) cubic yard in size within the area of the trench, or it shall be hard, durable ledge rock that cannot be easily removed by use of pick and shovel or by means of a power driven mechanical shovel.

7.3.3 Blasting: When blasting is done it shall fully comply with Township Ordinance No. 199 and be approved by the Engineer, and the Contractor shall assume all risks for damage incurred by any property, structures, persons, etc.

7.3.4 Blasting Procedure: Blasting for excavation will be permitted only after securing the approval of the Engineer, meeting the requirements of Ordinance No.199, and only when proper precautions are taken to monitor and provide for the protection of persons or property. The hours of blasting will be fixed by the Engineer. Any damage caused by blasting shall be repaired and the cost borne by the Contractor. The Contractor's methods or procedure, relative to blasting, shall conform to local, state laws and municipal ordinances.

7.3.5 Pre-blasting: When pre-blasting is used (fracturing of rock with explosives prior to actual trench excavation) the Contractor, if required by the Engineer, shall first verify that the rock cannot be removed by pick and shovel or by power driven mechanical shovel. Cost of such verification shall be at the Contractor's expense.

7.4 BELL HOLES REQUIRED: Bell holes of ample dimension shall be dug in earth trenches at each point to permit the jointing to be made properly.

7.5 BRACE AND SHEET TRENCHES: Wherever necessary to prevent caving, excavations in sand, gravel, sandy soil or other unstable material shall be adequately sheeted and braced. Where sheeting and bracing are used, the trench width shall be increased accordingly. Trench sheeting shall remain in place until the pipe has been laid, tested for defects and repaired, if necessary, and the earth around it compacted to a depth of two (2) feet over the top of the pipe.

7.6 CARE OF SURFACE MATERIAL FOR REUSE: If local conditions permit their reuse, all surface material suitable for reuse in restoring the surface shall be kept separate from the general excavation material.

7.6.1 Manner of Piling Excavated Material: All excavated material shall be piled in a manner that will not endanger the work and that will avoid obstructing sidewalks and driveways. Gutters shall be kept clear or other satisfactory provisions made for street

drainage.

7.6.2 Erosion and Sediment Control: Storage of excavated material for re-use must be in conformance with all provisions of Act 451 of the Public Acts of 1994, as amended, "Soil Erosion and Sediment Control Act" and all applicable rules of the Monroe County Drain Commissioner or other jurisdictional authority.

7.7 TRENCHING BY MACHINE OR BY HAND: The use of trench-digging machinery will be permitted except in places where operation of same will cause damage to trees, buildings, underground utilities, or existing structures, above or below grade, in which case, hand methods shall be employed.

7.8 BARRICADES, GUARDS AND SAFETY PROVISIONS: To protect persons from injury and to avoid property damage; adequate barricades, barrels, light arrow boards, construction signs, lights, flashing lights, and guards, as required, shall be placed and maintained, in accordance with the current edition of the Michigan Manual of Uniform Traffic Control Devices, during the progress of the construction work and until it is safe for traffic to use the trenched highway. Whenever required, flagmen shall be provided to prevent accidents. Rules and regulations of the appropriate jurisdictional authority respecting safety provisions shall be observed.

7.9 TRAFFIC AND UTILITY CONTROLS: Excavation for pipe laying operations shall be conducted in a manner to cause the least interruption to traffic. Where traffic must cross open trenches, the Contractor shall provide suitable bridge at street intersections and driveways. Hydrants under pressure, valve pit covers, valve boxes, curb stop boxes, fire or police call boxes, or other utility controls shall be left unobstructed and accessible during the construction period.

7.9.1 Flow of Drains and Sewers Maintained: Adequate provision shall be made for the flow of sewers, drains and water courses encountered during construction, and the structures which may have been disturbed shall be satisfactorily restored upon completion of the work.

7.9.2 Property Protection: Trees, fences, poles, and all other property shall be protected unless their removal is authorized; and any property damaged shall be satisfactorily restored by the Contractor and shall be incidental to pipe installation, unless otherwise stated in a specific Contract.

7.9.3 Interruption of Water Service: No valve or other control on the existing water system shall be operated for any purpose by the Contractor without approval of the Frenchtown Charter Township Water Department. All consumers to be affected by interrupted service shall be notified by the Contractor at least forty-eight hours before the operation and advised of the probable time when the service will be restored.

7.10 EROSION AND SEDIMENT CONTROL: All provisions of Act 451 of Public Acts of 1994, as amended, "Soil Erosion and Sedimentation Control Act" must be strictly adhered to. The Contractor must provide access for and cooperate with the licensed stormwater operator making required site inspections and reports for a project. Temporary soil erosion and sedimentation control measures required on the plans or by field conditions must be properly installed and maintained for the duration of construction and until permanent measures are effective. The Contractor is responsible for removing temporary measures upon acceptance of permanent measures.

7.10.1 Monroe County Drain Commissioner: Whenever excavation or trenching operations will extend to within 500 feet of a drain under the jurisdiction of the Monroe County Drain Commissioner, the Contractor must secure a permit prior to beginning work in these areas and fulfill permit conditions.

7.10.2 Monroe County Road Commission: Construction within county or state right of way, outside the jurisdiction of the Monroe County Drain Commission is subject to soil erosion and sediment control requirements of the Monroe County Road Commission (MCRC). The contractor must secure a permit from MCRC, if applicable.

7.10.3 Michigan Department of Environmental Quality: Whenever waterline installation will extend to within 500 feet of a drain, lake, river, or stream a permit must be secured from the Land and Water Management Division of the Michigan Department of Environmental Quality. The Contractor must adhere to all provisions of the permit. Additional permits and conditions will be required for work within wetland areas.

Section 8. PLACES OF DISPOSAL.

All excavated material not required or allowed for refilling or in embankments shall be removed and deposited at such locations as are specified, or, if no such locations are specified, the Contractor shall find suitable and legal dumping places for all such material. No material shall be deposited on private property until written consent of the owner or owners thereof has been filed with the Engineer. Placement of fill on private property within the Township must conform to Township regulations, ordinances, and fill permit requirements. No fill may be deposited on private property unless the Contractor has seen evidence of a Township Fill Permit secured by the property owner. All costs of disposal or surplus excavated material shall be included in the prices bid for excavation or items requiring excavation. Contractor is responsible for legal hauling of and disposal of all excavated material.

8.1 DISPOSAL OF EXCAVATED MATERIAL: Excavated material shall be disposed of and all dumps shall be leveled by the Contractor in the following order of preference:

A. Along the site of the work to fill requirements of the work, material for this

purpose shall be of the same type or better than the existing material where fill is required or where necessary to replace as backfill.

- B. On private property fronting the site of the project.
- C. On any Township owned property in or outside of the Township's limits.
- D. Adjacent to the work upon request of property owners, upon property within a two (2) mile haul and as directed by the Engineer.
- E. Nonadjacent to work beyond two (2) miles haul and as directed by the Township Engineer.
- F. Any balance remaining after the above requirements are filled shall be disposed of by the Contractor to his best advantage with no overhaul compensation.

The Contractor shall be entitled to "Overhaul" under the terms of this Contract for compensation for hauling beyond the two (2) mile limit upon orders of the Engineer. All free haul and "Overhaul" shall be made by written orders of the Engineer on order blanks having a number sequence.

- 8.2 SALVAGE:** In the case of structures, the service of which is permanently abandoned, the Engineer will designate which of the materials are to be salvaged and which are to be abandoned. The Contractor shall remove and deliver to a designated point of storage, materials ordered to be salvaged, and unless otherwise specified, no additional compensation will be allowed for this removal and hauling. Owners of privately owned structures shall be given reasonable notice and access to salvage their property. Structures designated as abandoned and not mentioned in plans or specifications to be salvaged shall become the property of the Contractor, and shall be removed from the work without additional compensation unless otherwise noted to remain. The Contractor shall not move nor disturb the structures in any way without the approval of the Township Engineer.

Section 9. PIPE LAYING.

9.1 STORAGE AND HANDLING

9.1.1 Manner of Handling Pipe and Accessories into Trench: Proper implements, tools, and facilities satisfactory to the Engineer shall be provided and shall be used by the Contractor for the safe and convenient execution of work. All pipe, fittings, valves and hydrants shall be carefully lowered into the trench piece by piece by means of derrick, ropes, or other suitable tools or equipment in such a manner as to prevent damage to pipe or coating, on fittings or pipe. Under no circumstances shall pipe or accessories be dropped into the trench. Any pipe material stored above ground for an

extended period of time (30 days or more) shall have the ends of the pipe covered and protected.

9.1.2 Pipe Kept Clean: All foreign matter or dirt shall be removed from the pipe before it is lowered into its position in the trench, and it shall be kept clean by approved means during and after installation.

9.1.3 Protection of Pipe: During the progress of the work, the Contractor shall take all precautions necessary to protect the pipe from injury. All damaged pipe shall be removed and replaced at the Contractor's expense. The working end or exposed end of a water main pipe line being installed shall have the exposed pipe end plugged and protected at the end of each day.

9.2 ASSEMBLY

9.2.1 General: The Contractor shall keep the trench free from water, and the assembly of pipe and couplings shall be made with dry and clean materials wherever possible. Pipe shall be Ring-tite couplings or equal.

9.2.2 Couplings: Couplings shall be assembled in such a manner that the couplings and rubber rings are placed concentrically over the ends of adjacent pipe in accordance with the manufacturer's instructions. After assembly of couplings, the ends of pipe within the coupling shall be separated a minimum of 3/8" to allow for the expansion and contraction of the pipe.

9.2.3 Joints to Non-Standard Pipe: Joints made between asbestos cement pipe and cast iron pipe or fittings shall be made by entering the asbestos cement pipe into standard or special bells on the cast iron pipe or fittings. In those cases where special bells are required but are not available, adapters with standard spigots and special bells shall be provided. The space between the asbestos cement pipe and the bell of the cast iron pipe or fitting shall be not less than 1/4" and shall be free from oil.

9.2.4 Joints Lubricant: Whenever a joint lubricant is required for joining potable water pipe sections together, the lubricant shall be NSF approved for contact with potable water and shall be approved by the pipe manufacturer.

9.2.5 Service Connections: Service connections shall be made using double strap brass saddle as previously specified and inserting a corporation stop into the barrel of the pipe. The insertion shall be made with a standard drilling and tapping machine under the direction of the Frenchtown Charter Township Water Department.

9.2.6 Cutting of Pipe: Whenever it is necessary to cut pipe, it shall be done with a sharp saw in such manner as to make a clean, even cut.

9.2.7 Joint Restraints: Whenever mechanical joint restraints are used, they shall be as previously specified and shall be installed in strict accordance with manufacturer's recommendations and approved shop drawings.

9.3 BEDDING AND BACKFILL

9.3.1 Pipe Bedding: Backfill below, along the side, and over the top of the pipe is considered pipe bedding. Bedding limits shall extend the full width of the trench. Bedding materials shall be placed a minimum of 3 inches below and 6 inches above the bell of all 12 inch diameter or smaller waterlines and a minimum of 6 inches below and 12 inches above the bell of all waterlines having a diameter greater than 12 inches but not greater than 24 inches.

Bedding material must meet the specifications and gradation requirements of MDOT 25A aggregate and shall be uniformly tamped in place along and under the full length of pipe.

9.3.2 Backfill: Trench backfill beyond the limits of pipe bedding shall conform to typical trench details as noted on the "Standard Watermain Details and Notes" drawing. In general, trenches under existing paved public roadways must be bored, if possible. Where boring is not an option, trenches must be backfilled with control density backfill, such as K-Crete or approved equal. Any roadway excavations for water main and or water service installations located within the Frenchtown Charter Township Resort District shall be backfilled with control density backfill in accordance with the rules and regulations of the Resort District Authority. Control density backfill material shall consist of a mix of Portland cement, fly ash, and selected granular materials, with a minimum density of 130 pounds per cubic foot and a minimum compressive strength of 50 PSI at 3 days and 75 to 150 PSI at 28 days. Trenches within the zone of influence of the public roadway, but not directly under pavement may be backfilled with controlled density backfill or compacted granular material (Class III Aggregate, or better) conforming to MDOT. Specifications for Embankment (Placing and Compacting Embankment). Test reports of materials, density testing, and certification of compliance with specifications must be filed with the Township Engineer and the Monroe County Road Commission if granular backfill is used. (The zone of influence of the public roadway is defined by the Monroe County Road Commission as the portion of the roadway located between the outside edges of the traveled way, including shoulders or back of curb, plus one foot (1') each side and extending outward and downward from there at 45 degrees.) Similarly, trenches under private roads (within Site Condominiums, multiple residential sites, commercial and industrial sites), drives, parking lots and other paved or traffic areas shall be backfilled with aggregates conforming to specifications and gradation requirements of MDOT Class III Aggregate, or better, and the Specifications for Embankment (Placing and Compacting Embankment) or Controlled Density Backfill.

Trenches beyond these limits may be backfilled with excavated material, which is free of large stones, clumps, or other deleterious material in accordance with MDOT Standards.

9.4 **DIRECTIONAL DRILLING**

9.4.1 General: This work shall consist of furnishing and installing fusible PVC water main pipe, as previously specified, using the Horizontal Directional Drilling Method as shown on the plans and as specified herein. Use of HDPE pipe material may be approved for use in locations where the water main will not be tapped for water services. The use of the HDPE pipe material will require approval by the Township Water Department and the Township Engineer.

The Contractor shall be responsible for installing the fusible PVC water main by the Horizontal Directional Drilling method within the work limits shown on the plans. Prior to starting any work activity, the contractor shall submit to the Township Engineer plans and details describing all equipment, activities, materials, preparation areas, etc. for the Horizontal Directional Drilling operation, which shall be reviewed for conformity with the project plans. Review by the Township Engineer of any Contractor plans and method shall not relieve the Contractor of his responsibility in this regard.

9.4.2 Construction Method: Pipe shall be free of cuts, mars, gouges or abrasions, which are greater than 10% of the wall thickness. Lower the pipe and assemblies into the trench by means of an approved nylon sling in such a manner as to prevent damage to pipe or assemblies. Construct watermain using directional drilling methods. Curve rather than deflect the pipe in accordance with the pipe manufacturer's recommended radius for the size and wall thickness of the pipe being installed. Upon completing the pull, the pipe shall be allowed to rest a minimum of 24 hours and or as recommended by the pipe manufacturer prior to trimming the pipe and or installing water stops and any fittings.

9.4.3 Pipe Joints: Join Fusible PVC and HDPE pipe sections and fittings using the following PPI approved methods:

A. Heat Fusion

1. Butt Fusion
2. Saddle Fusion
 - a. Conventional Heat Fusion
 - b. Electrofusion
3. Socket Fusion
 - a. Conventional Heat Fusion
 - b. Electrofusion

B. Mechanical Fittings:

1. Mechanical Joint Adapter

9.4.4 Fittings: Join Fusible PVC and HDPE pipe to Fusible PVC and HDPE fittings using butt fusion, saddle fusion, or socket fusion techniques. Butt fusion fittings shall have a manufacturing standard of ASTM 3261. Fabricated fittings shall be manufactured using Data Loggers, or approved equal. Temperature, fusion pressure and a graphic representation of fusion cycle generated by the Data Logger shall be submitted to the Engineer on a weekly basis and shall be part of the permanent records. Furnish evidence of fusion capabilities including, but not limited to, fusion charts identifying recommended fusion temperature and interface pressure and cooling time. Furnish evidence that the thermal fusion will be conducted by personnel who have received proper training in the use of fusion equipment according to the recommendations of the pipe supplier and the fusion equipment supplier. Molded and fabricated fittings shall have a pressure rating equal to the pipe, unless otherwise specified.

9.4.5 Joints to Mechanical Joint Pipe, Fittings, or Valves: Join Fusible PVC and HDPE pipe to mechanical joint pipe, fittings, or valves using a mechanical joint connector. The connector includes a mechanical joint Fusible PVC or HDPE adapter with a prepositioned stainless steel stiffener, a metal back-up drive ring, a standard rubber gasket, and longer corrosion resistant tee bolts with nuts. Connections to butterfly valves require four (4) full-face Type "E" gaskets and two spacers be installed at each valve.

9.4.6 Water Stops: Install Water Stops five feet (5') on either side of valves to the dimensions indicated on the "Standard Watermain Details and Notes", unless the manufacturer's recommendations are greater. The concrete used to form water stops shall have a minimum compressive strength of 3000 psi.

9.4.7 Cutting of Pipe: Pipe up to eight inches (8") in diameter shall be cut with a sharp saw in such manner as to make a clean, even cut. Pipe greater than eight inches (8") in diameter shall be cut with a chain saw without oil in the oiler. A soap or glycerin based solution may be used as a lubricant.

9.4.8 Safety: Mechanical, pneumatic or water jet methods shall not be used due to risk of surface settlement and associated damage.

Upon completion of the boring and pipe installation, the Contractor shall remove all spoils from the boring and receiving pits. The pits shall be restored to their original conditions as detailed in the plans and or approved in the shop drawing submittal.

Launch and pull pits shall be adequately shored and braced where the pits are located within the influence of vehicular traffic and or roadways.

Since Directional drilling may be performed in the vicinity of buried electric cables that are energized, the following will be required:

1. All drilling equipment shall have inherent alarm system, which will detect an electric current.
2. All crews shall be protected with grounded safety mats, heavy gauge ground cables with connectors, hat, boots and gloves.
3. All supervisory personnel shall be adequately trained and have direct supervisory experience in directional drilling.

Launch/pull pit locations and details shall be based upon the methods used by the contractor as dictated by his training, equipment and materials. The contractor's detailed work plan for horizontal directional drilling method shall include Launch/Pull pit locations, pertinent fittings and pipe materials, pipe restraints, any specific changes from the base plans and estimated time to complete the proposed method. It should be noted that any changes to the plans as shown within the road right of way of any public road shall be subject to approval by the Monroe County Road Commission (MCRC).

9.5 BORING AND JACKING STEEL CASING:

9.5.1 Boring: Where shown on the plans and where indicated, the Contractor shall install steel casing pipe by the combined boring-jacking operations. Also, where indicated on the plans or if ordered by the Engineer, the Contractor shall bore under trees, without a casing, and such work shall be a part of the unit price for water mains installed in place.

9.5.2 Steel Casing Pipe: Steel casing pipe shall be new and unused mill primed welded steel pipe conforming to ASTM-A-252 Grade 2 or better specifications. The casing pipe shall be asphalt coated on the outside. Pipe joints shall be welded. It shall have a minimum tensile strength of 60,000 P.S.I. and maximum yield strength of 35,000 P.S.I. Wall thickness shall be in accordance with "Standard Watermain Details and Notes".

9.5.3 Installation: The casing pipe shall have a cutting edge and a boring head shall be contained within the casing, with the casing leading the boring head. The casing shall be installed concurrently and ahead of the face of the excavation in such a manner as to allow the pipe to be laid at the proper grade. In no case shall water be used in conjunction with the boring operation. The Contractor shall bulkhead the ends of the casing. Fill is not required between the casing spacers.

9.5.4 Casing Spacers: Casing spacers must be secured to all waterline pipe which is installed in casing. Wood blocking is not acceptable for use as casing spacers. Casing spacers shall be stainless steel or ductile iron with polymer plastic runners or preformed projection-type high-density polyethylene. Casing spacers shall be manufactured in the United States by Advanced Products and Systems, Inc., Cascade Waterworks

Manufacturing, Public Works Marketing, Inc. or approved equal. All casing spacers shall be installed in accordance with manufacturer's specifications and recommendations.

Section 10. SETTING VALVES, VALVE BOXES, FITTINGS, AND BLOW-OFFS.

- 10.1 JOINTING TO ASBESTOS CEMENT PIPE:** Each valve or fitting, when connected to asbestos cement pipe, shall have a bell with an inside profile such that a seal can be made between the machined pipe end and the bell with a rubber ring
- 10.2 JOINTING TO HIGH DENSITY POLYETHYLENE PIPE:** HDPE flange adapters fused to the end of the HDPE pipe shall be joined to valves by means of a mechanical joint connector as detailed on the "Standard Watermain Details and Notes". In addition joining to butterfly valves requires the four (4) full-face Type "E" gaskets and two spacers for each valve. The gaskets shall be inserted between the face of the flanges and the spacer and between the flange adapter and the spacer.
- 10.3 SUPPORT OF FITTINGS:** Each valve shall be permanently supported independently of the pipe in accordance with the details shown on the plan sheet entitled "Standard Watermain Details and Notes".
- 10.4 PREPARATION OF BELL AND SPIGOT ENDS:** Before laying valves or fittings; all lumps, blisters and excess coating shall be removed from the bell. The inside of the bell shall then be wire-brushed and both the inside of the bell and the spigot end of the pipe wiped clean and dry. When sulfur base joint compound is used, oil and grease shall be removed. All joint compounds shall be NSF approved for contact with potable water and shall be supplied by the pipe manufacturer. All surfaces to be joined shall be kept clean until joints are made.
- 10.5 VALVE BOXES:** Valve boxes shall be firmly supported and maintained centered and plumb over the wrench nut of the gate valve, with the box cover flush with the surface of the finished pavement or at such other level as may be directed. All attempts shall be made to locate valve and valve boxes along rural roads at hydrant branch approaches. Where valve boxes are not located at hydrant branch approaches, the valve box shall be flush to the finish grade with no part of the box projecting more than 1" above finish grade that would be subject to damage by mowing equipment. The contractor shall monitor the finish grade at all valve box locations and shall regrade the area around the valve box should settlement occur causing the box rim to project more than 1" above the finish grade.
- 10.6 REACTION OR THRUST BLOCKS:** Reaction or thrust blocks shall be applied at bends, tees, plugs and where changes in pipe diameter occur at reducers or in fittings. The design of concrete thrust blocks shall be as specified on the plan sheet entitled "Standard Watermain Details and Notes."

- 10.7 JOINT RESTRAINTS:** Mechanical joint restraints, as previously specified, may be used in lieu of thrust blocks only upon review and approval by the Township Engineer and the Frenchtown Charter Township Water Department. The Contractor must submit shop drawings for review and approval no less than two weeks prior to scheduling their use on the job.
- 10.8 BACK-SIPHONAGE TO BE PREVENTED:** Drainage branches or blow-offs shall not be connected to any sewer or submerged in any stream or be installed in any other manner that will permit back-siphonage into the distribution system.
- 10.9 BLOW – OFF ASSEMBLY:** Blow – Off assemblies shall be installed at locations shown on the plans and shall be in accordance with the “Typical Blow – Off Assembly” as detailed on the “Standard Watermain Details and Note” drawing.

Section 11. USE OF MAIN.

The owner shall have the progressive use of the watermains after they have passed hydrostatic and bacteriologic testing between valved sections.

Section 12. HYDRANT LOCATION AND USE.

- 12.1 GENERAL LOCATION:** Hydrants shall be located in a manner to provide complete accessibility, and in such manner that the possibility of damage from vehicles or pedestrians will be minimized. Unless otherwise directed, the setting of any hydrant shall conform to the following:

12.1.1 Location Regarding Curb Lines: When placed behind the curb, the hydrant barrel shall be set so that no portion of the pumper or hose nozzle cap will be closer than 4 feet from the curb face. Hydrants shall not be located within the radius section of any road intersection and shall be no closer to the intersection than 8’ from the intersecting road right-of-way line extended to the curb line. All hydrants shall be placed in the manner designated by the Township Engineer.

12.1.2 Location Regarding Sidewalk: When set in the lawn space between the curb and the sidewalk, or on the backside of the walk where a water main easement is located adjacent to the property line, no portion of the hydrant or nozzle cap shall be within 6" of the sidewalk.

12.1.3 Location Regarding Uncurbed Roads: When set on uncurbed roadway or service drive, the hydrant barrel shall be located 2 feet inside the public right of way, unless otherwise indicated. Drive approach from roadway with culvert must be provided where required by grading and drainage.

- 12.1.4 Locations of High Points along the Water Main:** Wherever possible, the location of high points along the water main shall be coordinated to occur at proposed hydrant locations to eliminate the need for air relief valves at these locations.
- 12.2 POSITION OF NOZZLES AND BREAK-AWAY FLANGE:** All hydrants shall stand plumb, and shall have their nozzles parallel with or at right angles to the curb or roadway with the pumper nozzle pointing normal to the curb, or edge of roadway, except hydrants having hose nozzles at an angle of 45° shall be set normal to the curb, or edge of roadway. They shall conform to the established grade, with nozzles at least 18" above and not greater than 24" above the finish grade. The hydrant shall be installed and set to place the break-way flange 1¾" to 3" above the finish grade or as specified by the hydrant manufacturer.
- 12.3 CONNECTION TO MAIN:** Each hydrant shall be connected to the main pipe with a 6" ductile-iron branch controlled by independent 6" resilient seated gate valve, except as otherwise directed. The configuration of the hydrant setting shall be as shall be in accordance with the detail on the "Standard Water Main Details and Notes" drawing, as noted on the plans or as directed by the Engineer in the field.
- 12.4 DRAINAGE OF HYDRANT:** All hydrants shall be furnished and installed with the drainage hole factory plugged.
- 12.5 ANCHORAGE FOR HYDRANT:** The bowl of each hydrant shall be well braced against unexcavated earth at the end of the trench with concrete thrust block or it shall be tied to the pipe with suitable mechanical joint restraints. Hydrants shall be firmly braced until the backfill is firmly tamped around them.
- 12.6 CLEANING:** Hydrants shall be thoroughly cleaned of dirt or foreign matter before setting.
- 12.7 PAINTING:** Hydrants shall be factory painted yellow above grade and black below grade with machinery enamel.

Section 13. PLUGGING DEAD ENDS.

Standard plugs shall be inserted into the bells of all dead ends of pipes, tees or crosses, and spigot ends shall be capped. Plugs or caps shall be joined to the pipe or fitting in the manner specified and shall be secured with thrust blocks or mechanical joint restraints.

Section 14. DISINFECTION OF COMPLETE PIPE LINE.

Before being placed in service and before certification of completion by the Engineer, all new water systems, or extensions to existing systems or valved section of such extension, or any

replacement in the existing water system, or any exposed section of the existing system shall be flushed and disinfected in accordance with the current State of Michigan procedures and AWWA C651. Water mains shall be thoroughly filled and flushed prior to disinfection. The contractor shall be responsible for all cost to furnish water for flushing, disinfection and hydrostatic testing purposes on the new water system. If the contractor chooses to use water from an existing Township water system hydrant for testing purposes, he shall obtain and install a hydrant meter from the Township Water Department before performing any flushing and testing on the new water system.

14.1 **CHLORINATION TAP:** The Contractor must install chlorination tap(s) as required consisting of 3/4 or 1 (one) inch corporation tap with a 3/4 or one (1) inch copper water line extending above the surface of the ground with valving as required to plug and maintain pressure on the line.

14.2 **CHLORINATION:** The Contractor will perform all necessary work to chlorinate the water mains and its appurtenances. A chlorine solution shall be injected into the water main of sufficient strength to create a 50 ppm minimum and not exceeding 200 ppm maximum chlorine solution in the main. The use of chlorine granules and tablets shall not be used to chlorinate any water main. The contractor shall furnish and install a goose neck fitting at all sampling locations for the purpose of collecting water samples by the Frenchtown Charter Township Water Department. The Frenchtown Charter Township Water Department must verify that the 50 ppm minimum has been achieved. The type of chlorine used, mixing rates and application rate shall be approved by the Engineer. The strong chlorine solution shall remain in the water main a minimum of 24 hours after verification before residual samples are taken. A test of this sample must show a minimum of 50 ppm.

Twenty-four hour notification shall be given to the Township Water Department by the Contractor to allow coordination of the date and time such samples are to be taken. The Contractor shall re-chlorinate the water main if the test conducted on the samples taken does not meet current Township Water Department standards. At the time of chlorination, all hydrant valves and intermediate main line valves shall be operated. All cost of chlorination, installation of corporations, fittings and related materials and labor shall be at the Contractor's expense.

Section 15. HYDROSTATIC TESTS.

After any section of pipe is laid between valves, the pipe shall be filled with water and subjected to a hydrostatic pressure of 150 lbs. per square inch ± 5 psi for a period of two hours in accordance with AWWA C600. Tests shall be performed by the Contractor and witnessed by the Frenchtown Township Engineer. The Contractor must use testing equipment provided by the Frenchtown Township Water Department. The actual cost of the test shall be borne by the Contractor. All mains to be tested with hydrants in place and with hydrant connection valves open. No hydrostatic tests will be performed prior to completion of chlorination tests by

the Township Water Department and the line is flushed clear of any chlorine residual.

15.1 PROCEDURE: Each section of pipe line shall be slowly filled with water and the specific test pressure, measured at the point of lowest elevation shall be applied by means of pump connected to the pipe, in a manner satisfactory to the Engineer. The pump and pipe connection shall be furnished by the Contractor. The Township will furnish testing apparatus and gauges. Labor necessary to make taps into the pipe shall be furnished by the Contractor at no cost to the Township.

15.1.1 Expelling Air Before Test: Before applying the specified test pressure, all air shall be expelled from the pipe. To accomplish this, hydrants located at high points shall be opened to expel trapped air or taps shall be made, if necessary, at points of highest elevation and afterward tightly plugged.

15.1.2 Connection To Existing Mains: When the pipe is to be connected to an existing valve or main, the Contractor shall make the connection only after the new water main pipe has been pressure tested, chlorinated, and has passed the Bacteria test. The Contractor may elect to connect the new water main to the existing pipe or valve prior to pressure testing; only after verifying existing pipe or valve is capable of meeting the pressure test requirements and upon approval of the Frenchtown Township Water Department.

15.1.3 Air Test: Prior to tapping an existing main for a new main extension, the Contractor shall install the tapping saddle and apply a 90 pound air test in accordance with Section 2.6 Tapping Sleeves.

Section 16. BACTERIOLOGICAL TEST.

Following passing results of the residual chlorination testing and before the new main is connected to the system, all treated water shall be thoroughly flushed from the main and the replacement water shall fill the entire length with the chlorination levels in the replacement water being 3 ppm or less.

The Township Water Department will collect two sets of samples, taken at least 24 hours apart from the new main. These will be tested for bacteriological quality in accordance with AWWA C651. For sample collection scheduling, the Frenchtown Charter Township Water Department will only schedule to collect first sample sets on Monday through Thursday with the latest schedule date for the second set of samples being Friday. No weekend sampling will be permitted.

The procedure must be repeated starting with the first chlorination test upon failure of either the chlorination test or the bacterial test. All tests must be satisfactorily passed prior to making permanent connection to existing systems. Final connections to the distribution system must be made using sanitary construction practices so as to prevent contamination of new or existing

systems.

Section 17. STRUCTURES.

17.1 NEW STRUCTURES: New structures shall be constructed as indicated on the plans and of the material specified. In general, structures will be indicated in the Proposal as a unit and this work shall include necessary excavation of earth and rock, furnishing of materials, labor, clean-up, etc., incidental for the completion of the whole unit of construction.

17.2 EXISTING STRUCTURES

17.2.1 Existing Structures Requiring Modification: Existing structures encountered in the work which require some alteration or demolition will be indicated on the plans and, if not, any work necessary to the progress of the project shall be ordered by the Engineer.

17.2.2 Payment for Modification of Existing Structure: Alteration or Demolishing of any Structure, etc. will be indicated in the Proposal. In general, when this work is not included in the Proposal, it shall be regarded as incidental to item of Excavation with no additional payment.

Section 18. VALVE MANHOLES.

18.1 CONSTRUCTION

18.1.1 Materials: Manholes shall be built according to the details of the plans and at locations shown. Manholes may be constructed of block or precast concrete. Block manholes shall be built of block laid radially with each seventh course as stretchers with one-quarter inch mortar joints. Riser sections for precast concrete manholes shall conform to ASTM C478.

18.1.2 Manhole Tops: The upper three feet of manholes shall be eccentric dome, drawing in on all sides to fit the adjusting rings.

18.1.3 Sealing: Manholes shall be thoroughly bonded to the barrel of the water main and all connections to pipes made without projections or voids. Interior and exterior of block and adjusting rings shall be plastered with one-half inch cement mortar.

18.1.4 Casting Grade Adjustments: Adjustments to meet the final design grade shall be set with precast reinforced concrete adjusting rings as detailed on the plans. The maximum allowed depth of adjusting rings shall be twelve (12) inches. Minor adjustments to plan grade may be determined by the Engineer in the field at no extra cost to the Owner.

18.1.5 Earth Excavation: The excavating for manholes shall be vertical or slanting with no overhang over the work. It shall be to the same depth as the bottom of the stone bedding for the manhole base and shall have diameter not less than three (3) feet greater than the outside diameter of round manholes or three (3) feet greater than any side dimension of square or rectangular manholes.

18.1.6 Rock Excavation: Where rock is encountered, the excavation shall be vertical and to the same depth as for earth excavation. It shall be of the same diameter or side dimension as for earth when manholes are of brick, but can be of the same diameter or side dimension as the outside of the manhole when it is built of concrete.

18.1.7 Steps: Manhole steps shall be firmly built into the walls not more than sixteen (16) inches apart.

18.1.8 Frames and Covers: Manhole frames shall be set in a full bed of mortar. Frames and covers shall be as specified herein or as required by the Frenchtown Charter Township Water Department.

Section 19. CONCRETE STRUCTURES.

19.1 CONCRETE MATERIAL: Concrete shall consist of a mixture of Portland cement, coarse aggregates and water, proportioned in accordance with the requirements of MDOT 2003 Standard Specifications for Construction. Admixtures shall be included with these primary ingredients when specified.

19.1.1 Classification: Concrete shall be classified and proportioned on the basis of mix requirements. MDOT. specifications shall be met, except as modified herein. There shall be grades designated as Class 1, 2, and 3.

Class 1 concrete shall generally conform to MDOT grade T having a compressive strength at 28 days of 3500 pounds or more per square inch when cured in a moist room at 70° for 28 days.

Class 2 concrete shall generally conform to MDOT grade S2 having a compressive strength at 28 days of 3500 pounds or more per square inch when cured in a moist room at 70° for 28 days.

Class 3 concrete shall generally conform to MDOT grade S3 having a compressive strength at 28 days of 3000 pounds or more per square inch when cured in a moist room at 70° for 28 days.

19.2 PLACEMENT

19.2.1 Handling and Placing: No concrete shall be used which does not reach its final position in the forms within one (1) hour after water is first added to the mix, except when the concrete is continually agitated when the time may be extended to one and one-half (1-1/2) hours.

19.2.2 Depositing Concrete Under Water: Concrete, until it has set, shall not be exposed to the water by which it is surrounded, it shall not be deposited in water except with the approval of the Engineer and under his immediate supervision; and in that case the method of placing shall be as hereinafter designated.

Concrete deposited in water shall be Class 1 with ten (10) percent excess cement. To prevent segregation, concrete shall be carefully placed in a compact mass, in its final position, by means of a tremie, a bottom dump bucket or other approved method, and shall not be disturbed after being deposited. Still water shall be maintained at the point of deposit and the forms under water shall be watertight.

For parts of structures under water, when possible, concrete seals shall be placed continuously from start to finish, the surface of the concrete shall be kept as nearly horizontal as practicable at all times. To insure thorough binding, each succeeding layer of a seal shall be placed before the preceding layer has taken initial set. All laitance or other foreign matter shall be removed from the top surface before any concrete is placed upon it in the dry.

A tremie shall consist of a tube having a diameter of not less than ten (10) inches, constructed in sections having flanged coupling fitted with gaskets. The tremies shall be supported so as to permit free movement of the discharge and over the entire top surface of the work so as to prevent water entering the tube and shall be entirely sealed at all times; the tremie tube shall be kept full to the bottom of the hopper. When a batch is dumped into the hopper, the flow of concrete shall be induced by slightly raising the discharge end, always keeping it in the deposited concrete. The flow shall be continuous until the work is complete.

19.3 SPUDDING AND VIBRATION

19.3.1 Spudding shall be used in all work if deemed necessary by the Engineer. The spuds shall be of such lengths that they will reach the bottom of the concrete poured. Care should be taken to spud the concrete in and around the reinforcing and at the form faces so that the entrapped air will be brought to the surface.

19.3.2 Vibration: All Class 1, 2, and 3 concrete, except that in pipe cradles, immediately after having been placed in the forms, shall be subjected to high frequency

vibration by means of vibrating tool arranged to be inserted within the mass of the concrete from above, the tool being so arranged that, due to its own weight, it will embed itself in the concrete to the full depth of the concrete just placed. The tool shall be of such diameter that it will not disturb or wedge the reinforcement from its specified position. The tool shall impart sufficient energy to the concrete to make it plastic and flowing so that when the forms are removed, there will be no stony pockets or segregation. The tool shall operate at frequencies in excess of five thousand (5,000) impulses per minute and shall be allowed to remain in the concrete long enough to puddle the concrete thoroughly but no longer.

In the placement of concrete in roof slabs, the vibrating tool shall be provided with a short handle so constructed that vibration of the tool will not be transmitted to the operator and permitting the operator to control the position of the tool with ease. As the concrete is deposited in the forms the vibrating tool shall be inserted at close intervals and to a depth, which will permit the tool to vibrate concrete through the lateral motion of the tool and at the same time permit the tool to transmit vibrations to the supporting forms. The tool shall be reinserted under the flanges of girder beams, entrant angles in the forms and wherever it is necessary to force the concrete to flow into proper position. The tool shall be inserted at locations close enough together to insure that the whole mass of concrete being treated shall have been subjected to adequate vibration. If it is evident after the tool has operated for a reasonable length of time that stony pockets still remain due to a deficiency of mortar, such stony pockets shall be removed, fresh concrete substituted and vibration repeated until the condition of segregation disappears.

The Contractor shall have a sufficient number of vibrating tools available to accomplish the results desired.

19.4 CONSTRUCTION JOINTS: Concrete shall be deposited continuously and as rapidly as possible until the unit of operation, as approved by the Engineer, is completed. Construction joints at points not provided for in the plans shall be subject to the approval of the Engineer.

19.5 CURING: All exposed surfaces of finished and unfinished work shall be kept constantly moist by sprinkling with water at short interval, or by such means as the Engineer shall direct, and this moistening shall be continued until, in the opinion of the Engineer, the concrete has sufficiently hardened.

19.6 PROTECTION OF SURFACES: Sufficient tarpaulin or other covering shall be provided to protect freshly laid work from the action of the elements.

19.6.1 Protection from Traffic: No wheeling, working or walking on finished surfaces will be allowed for twenty-four (24) hours after the concrete is deposited.

19.6.2 Temperatures: When the air temperature falls to 40° F. or less, no concrete shall be deposited unless the aggregate and water have first been heated so that the mixture shall have a temperature on leaving the mixer between 70° F. and 100° F. When the temperature falls to 20° F or less, concrete pouring shall be stopped and shall not be resumed until the temperature has risen about 20° F.

19.6.3 Frozen Base: No concrete shall be poured on a frozen, dry or uncompacted subgrade.

19.6.4 Hot Weather Curing: All exposed surfaces of concrete shall be protected from the sun and the wind and kept wet in dry weather for fourteen (14) days after placing.

19.7 GENERAL CONCRETE FINISH: Unless otherwise specified, exposed concrete surfaces shall be finished as follows:

Immediately after the face forms are removed, the surface shall be freed from inequalities and projections by scraping. All voids shall be filled by floating with cement mortar, and the entire surface shall be brushed or broomed with a thin wash, composed of equal parts of cement and fine, sharp sand in as many successive coats as may be required to produce an even surface in finish and color.

19.8 REINFORCEMENT: All reinforcement bars shall have the dimensions and shall be placed as shown on the plans and details. The bars shall be supported at intervals of not more than three (3) feet by bent steel or molded concrete chairs of approved pattern, to maintain them in position with respect to the forms, and they shall be wired together at all intersections with two turns of No. 12 wire.

All bars shall be protected from exposure to the weather until used, and immediately before placing them in the concrete they shall be thoroughly cleaned of scale and any rust, grease or dirt that may have accumulated on them. Exposed reinforcement intended for bonding with future extensions shall be protected from corrosion.

The reinforcement shall be bent to shapes shown on the plans. The radii of bends shall be equal to or greater than twice the diameter of the bar, measured from the inside of the bent bar, except for stirrups in which the bends shall be equal to or less than three times the diameter of the bar. When bars are heated for bending, they shall not be heated to a higher temperature than that producing a dark cherry red color. Only competent persons shall be provided for the work.

All reinforcement shall be furnished in the full lengths indicated upon the plans. No splicing of bars, except where shown on the plans, will be permitted without the written approval of the Engineer. Splices which are permitted shall have a length of not less than forty (40) times the nominal diameter of the bars, and shall be well distributed or

else located at points of low tensile stress. No splices will be permitted at points where the section is not sufficient to provide a minimum distance of two (2) inches between the splice and nearest adjacent bar or the surface of the concrete. The bars shall be rigidly clamped or wired at all splices in manner approved by the Engineer.

19.9 FORMS: All centers of forms shall be collapsible, of ample strength, rigidly braced, with smooth surfaces against the concrete. Ribs and bracing may be constructed of either wood or steel, and must be of adequate strength to prevent deviation of the line. Ribs shall be cut or fabricated to exact dimension, and all ribs shall be matched before the sheathing is fastened to them. Unless otherwise specified on the plans, sheathing over ribs shall be constructed of plywood, cut plywood to exact size and curvature before assembling. Plywood used for this purpose shall be securely fastened to the ribs, and shall be of such size as to reduce the number of joints to a minimum.

All joints shall be butt joints, and shall fit together in such a manner as to leave no large marks on the finished concrete surfaces. Sections of forms shall be constructed with all ends exact duplicates, so that when the form is moved ahead, after pouring, the rear end of the section will fit exactly into the front end. Any section in which the space at any point as outlined above, if more than one-eighth (1/8) of an inch, shall not be used on the work; this restriction to apply to each movement of the section. All forms shall be maintained in first class condition during the entire period of their use, and any forms ordered repaired may again be used in the work.

In the determination of the time for removal of false work and forms, consideration shall be given to the location and character of the structure, the weather and other conditions influencing the setting of the concrete, and the materials used in the mix. Methods of form removal likely to cause overstressing of the concrete shall not be used. Forms and their supports shall not be removed in such a manner as to permit the concrete to uniformly and gradually take the stresses due to its own weight.

If form removal is not controlled by tests for compressive strength, the following periods, exclusive of days when the temperature is below forty (40) degrees F., may be used as a guide for form removal:

- for arches. 14 to 21 days
- for reinforced slabs. 14 to 21 days
- for walls 7 days

Should the Contractor desire to remove the forms in a shorter time than designated above, the removal must be controlled by tests for the strength of the concrete, and the forms shall not be slackened until the concrete has attained a compressive strength of at least fifteen (1500) pounds per square inch. This compressive strength shall be determined by the testing laboratory designated by the municipality from specimens cast at the time of pouring of the concrete. The specimens shall be stored and cured under conditions similar to the concrete structure. The cost of these tests shall be borne by the

Contractor. The Contractor shall be responsible for all damage caused by the premature removal of forms.

Section 20. PAVEMENT, CURB AND WALK RESTORATION.

- 20.1 GENERAL:** The Contractor shall replace all pavement, sidewalk and curb and gutter that is broken or removed during the water main construction.

All such replacement shall be done in accordance with the Township's specifications for each type of work.

All materials and workmanship shall be subject to inspection by the Township Engineer.

- 20.2 WORK INCLUDED:** Under the heading Pavement, Curb and Walk Restoration is included the work of tearing up such areas of pavement other than stone aggregate surfaces, as may be required for the construction of water main appurtenances therein; of removing and disposing of all materials torn up; of placing a temporary pavement to carry traffic until such time as the backfill has settled and the permanent pavement may be laid; of subgrading for the permanent pavement including the accurate removal and the disposal of all materials for the width of the proposed pavement and foundation to be laid; of compacting or rolling of subgrade as specified or directed by the Township Engineer; and of permanently repaving these areas.

- 20.3 TEMPORARY PAVEMENT:** In placing the temporary pavement, the backfill shall be compacted in accordance with MDOT. 2003 Specifications, Section 206, up to the level of the pavement subgrade, after which the pavement, as shown on the plans, or as required by the Township Engineer shall be placed and compacted as far as possible without requiring the use of a roller. This temporary pavement may be crowned at the discretion of the Township Engineer or appropriate jurisdictional agency, but in no case shall this crown be more than three-quarters (3/4) of an inch in height for each foot of width of pavement. The Contractor shall maintain this temporary pavement in condition adequate for its usual traffic, until such time as it is replaced by the permanent pavement, and shall be liable for any claims or damages arising from his neglect to maintain the temporary pavement.

- 20.4 PERMANENT PAVEMENT:** The permanent pavement shall be laid at such time as the Engineer may permit, but in no case in less than two weeks after the trench was backfilled, except as specified below, nor more than one (1) year after the temporary pavement during the above stated period upon receipt of notice from the Engineer. Such replacement must be under local inspection and in accordance with the local standard specifications for the kind of pavement to be laid.

When specified on the plans or in the proposal, and permitted under local laws,

regulations and ordinance; permanent paving over trenches may be laid immediately after the water main structure is completed and the trench backfilled and properly compacted to subgrade elevation. In this case, the permanent surface course shall be supported on a concrete or reinforced concrete base having the thickness and reinforcement shown or specified on the plans. This base shall have a satisfactory bearing at least one (1) foot each side of the trench, and shall be designed to support the maximum allowable surface loads over the trench.

The Contractor shall guarantee all permanent pavement for the period specified in the Contract. If, within the period of guarantee, any of the work shall prove to be defective either in materials or workmanship, or if damage occurs by settlement of the backfill, the Contractor shall immediately upon demand of the Engineer (whose decision as to such defectiveness shall be binding and conclusive upon the parties hereto) repair and replace the same at the Contractor's own cost and expense. All repairs and replacements shall be done to the satisfaction of the Engineer and subject to his approval. Concrete pavements shall be replaced with Class 1 concrete.

20.5 WALKS AND CURBS: Walks and curbs shall be of Class 1 concrete laid to proper lines and grades after proper settlement of the trench backfill. Under walks the trench backfill shall be thoroughly tamped or flushed or both as necessary with the top one (1) foot to be of approved crushed stone well tamped.

Section 21. RESTORATION OF CONDITIONS.

All rubbish or refuse and all unused materials and tools shall be removed promptly from the premises, and as the work progresses it shall be carefully cleaned and kept clean from such rubbish and refuse. Before the work will be considered as having been completed, the sites and places affected by the work shall be thoroughly cleared and left clean; free from debris, construction plant, buildings, and materials; fit for travel and other intended use; and in as good or better condition as existed before the work was begun. Grass plots disturbed shall be resodded or planted anew. The restoration work shall be governed by a record of existing conditions made and filed in the office of the Township Engineer previous to the commencement of the work.

Section 22. LANDSCAPING RESTORATION.

Work included shall be grading, the replacement of trees, shrubs, and topsoil, and placement of topsoil, fertilizer, seed and mulch. Sod shall be placed if specified in the proposal. Work and materials shall conform to the MDOT 2003 Standard Specifications for Construction, except as modified herein or by the plans.

22.1 MATERIALS

21.1.1 Seeds: Seed shall meet the requirements for purity and germination as specified

in the proceedings of the Association of the Official Seed Analysis, Rules for Testing Seeds. Seeds shall be furnished in durable bags. On each bag of seed, the vendor shall clearly mark the name, lot number, net weight, contents, purity and germination.

21.1.2 Seeding Mixture: Grass seed mixtures applied to residential properties shall be MDOT “THM” and for rural roadside locations shall be MDOT “TDS” unless otherwise modified on the plans.

22.1.3 Chemical Fertilizer for Seeding: Chemical fertilizer shall be a ready-mixed granular material containing equal amounts by weight of available Nitrogen (N) readily available Phosphoric Acid (P₂O₅) and total available Potash K₂O mixed with not less than 40 percent by weight of filler. Chemical fertilizer shall be supplied with manufacturer certification of analysis and weight.

22.1.4 Mulching Materials for Seeding: Straw mulch shall be straw or marsh hay. Straw and excelsior mulches shall be an approved material.

22.1.5 Latex Base Adhesive for Mulching: The composition, by weight, of the latex emulsion polymer shall be 48 percent styrene, 50 percent butadiene, and 2 percent additive; 42.0 to 46.0 percent solids; and a pH, as shipped, of 8.5 to 10.0. The emulsion shall not be allowed to freeze or to be exposed to sunlight for a prolonged period of time.

22.1.6 Mulch Blankets: The Contractor must submit manufacturer's specifications to the Engineer in accordance with the procedure for shop drawing submission, for the particular straw or excelsior mulch blanket product intended to be used on a project.

22.1.7 Topsoil: Topsoil shall consist of the dark, organic, natural surface soil encountered in the project area or imported. Topsoil shall be free of stones 1 inch or greater in any dimension.

22.2 TIME OF PLACEMENT

Seed: April 15 to May 15; August 15 to October 1

Sod: April 15 to June 15; August 15 to November 1

Trees: (Bare-Root) April 1 to May 15; September 15 to October 1

Trees: (Balled) March 1 to June 1; September 1 to November 1

22.3 PLACEMENT

22.3.1 Preparation of Earth Bed: All areas to be seeded shall be free of rock and

other foreign material 3 inches or greater in any dimension, the earth bed shall be friable to a minimum depth of 3 inches and at the correct grade.

22.3.2 Placing Topsoil: In all areas specified, topsoil shall be spread on prepared areas to a depth of not less than 3 inches. After spreading, any large clods and lumps shall be broken and foreign material removed and disposed of and the finish surface shaped to conform to plan.

22.3.3 Seeding: The seed shall be thoroughly mixed and evenly sown over the prepared areas. Seed shall be sown following, or in conjunction with, the fertilizer. Seed shall be sown mechanically, by broadcast method or by hydro-seeder. Areas which are residential or urban and other areas which had existing lawns prior to water main installation shall be seeded with the following mixture: Perennial Ryegrass, 30%; Kentucky Bluegrass, 30%; and Creeping Red Fescue, 40%. All other areas shall be seeded with the following mixture: Perennial Ryegrass, 50%; Kentucky Bluegrass, 15%; and Creeping Red Fescue, 35%.

22.3.4 Setting the Seed: Seeded areas shall be floated and lightly compacted to incorporate the seed into the uppermost one-half inch of the soil.

22.3.5 Mulching: Immediately after setting the seed, straw or excelsior mulch shall be placed over the seeded area to a uniform thickness at a rate of 2 tons per acre. Mulch shall be anchored with mulch adhesive. Mulch adhesives shall be applied by spraying simultaneously with the mulch or by spraying a surface application of adhesive immediately following mulching. Latex base adhesives shall be applied at a rate of 400 gallons/acre.

22.3.6 Mulch Blankets: Mulch blankets must be placed in accordance with manufacturer's recommendations.

22.3.6 Watering: The seed shall be thoroughly watered as soon as the seed is covered. Care should be exercised not to dislodge the seed.

Section 23. PENALTY.

Any person, firm or corporation, their shareholders, directors and/or officers violating any provision of this Ordinance shall be guilty of a misdemeanor and subject to a fine of not more than \$500.00 and/or by imprisonment in the County Jail for a period not to exceed ninety (90) days or by both fine and imprisonment within the discretion of the court. The imposition of any sentence shall not exempt the offender from compliance with the requirements of this Ordinance.

Section 24. NUISANCE PER SE.

Any person, firm or corporation, their shareholders, directors and/or officers violating any provision of this Ordinance shall be deemed to be permitting a nuisance per se injurious to the public health, safety and welfare of the citizens of Frenchtown Charter Township. The Township may seek equitable relief for the abatement of the violation in a court of competent jurisdiction as well as the costs to the Township in the enforcement of the Ordinance.

Section 25. REPEAL.

Ordinance No. 183 and any amendments thereto and all Ordinances in conflict with this Ordinance are to the extent of such conflict hereby repealed as of the Effective Date of this Ordinance.

Section 26. SEVERABILITY.

This Ordinance and the various parts, sentences, paragraphs, sections, subsections, phrases and clauses thereof are declared to be severable and if any of them are adjudged unconstitutional or invalid, it is hereby provided that the remainder of the Ordinance shall not be affected.

Section 27. EFFECTIVE DATE.

This Ordinance shall become effective thirty days after adoption and publication in a newspaper having general circulation in the Charter Township of Frenchtown, Monroe County, Michigan.

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